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PRESERVATIVE SOLUTION FOR PAPAYAS AND METHOD FOR STORING AND PRESERVING PAPAYAS

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Abstract

A preservative solution for papayas and a method for storing and preserving papayas are provided. Use of the preservative solution effectively slows down the ripening of papaya fruits by 4 to 6 days, significantly increasing the economic benefits of papayas.

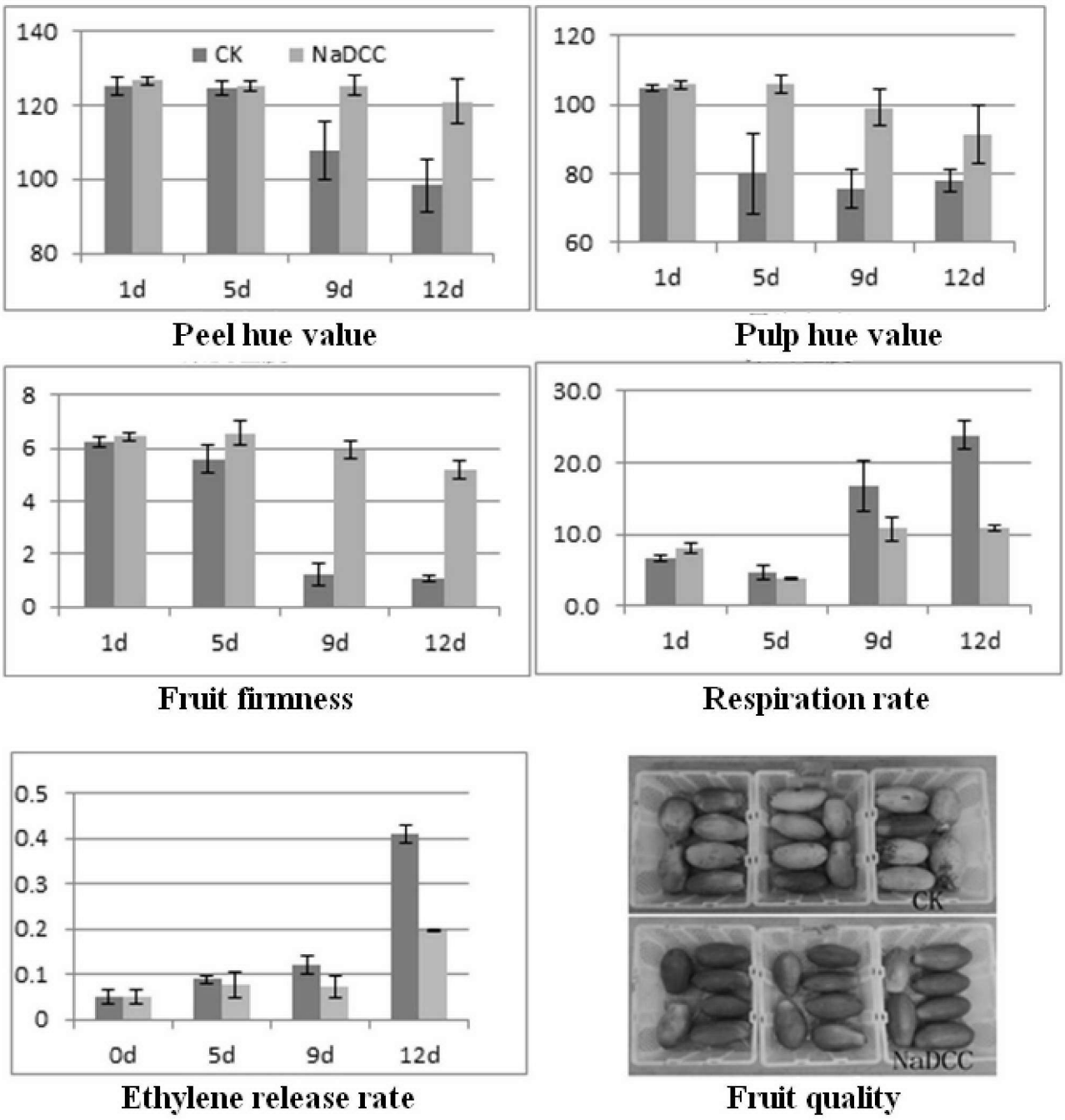

FIG. 1

PRESERVATIVE SOLUTION FOR PAPAYAS AND METHOD FOR STORING AND PRESERVING PAPAYAS

TECHNICAL FIELD

The invention relates to the technical field of fruit storage and preservation, and particularly relates to a preservative solution for papayas and a method for storing and preserving papayas.

BACKGROUND

Papaya (*Carica papaya L.*) belongs to the genus *Carica Linn*. Papayas are native to tropical America and are widely grown in southern Fujian, Taiwan, Guangdong, Guangxi, and southern Yunnan. Papaya fruits are nutritious, rich in saccharides, proteins, calcium and a variety of vitamins, especially vitamin A, vitamin B and vitamin C; they also have the function of aiding digestion and treating stomach diseases. As a typical climacteric fruit, postharvest papayas exhibit rapid ripening and softening, being the main factor limiting long-distance transport.

Preservation methods for papayas mainly include: (1) Heat-shock: a preservation method that extends shelf-life and maintains fruit quality by heat-shock treatment (such as hot air or hot water). For example, Chinese patent application 201310497572.0 involves a method for the preservation of papayas by using postharvest precooling in combination with heat treatment and ethylene inhibitor; Chinese patent application 201110098069.9 involves a method for the preservation of papayas by washing fruit stalks with a cleaning agent and

soaking the fruits in hot water. (2) Fumigation: a method for preservation by fumigating with substances such as essential oils, sulfur dioxide and 1-methylcyclopropene. For example, Chinese patent application 201610753216.4 involves a method for storing and preserving papayas by 1-methylcyclopropene (1-MCP) fumigation in combination with natamycin spray. (3) Chemical preservation: a preservation method by soaking or spraying fruits with a single chemical agent or a combination of chemical agents. For example, Chinese patent application 201410273697.X involves a method for the postharvest preservation of papaya fruits by using ascorbic acid, pyrogallic acid, epigallocatechin, and gallate esters. Chinese patent application 201110280537.4 involves a method for the preservation of papaya fruits by soaking in a hydrogen peroxide solution. (4) Preservative coating: a method for preservation and storage by applying materials such as oligosaccharides and starch to form an elastic film on the fruit surface. For example, Chinese patent application 201010227131.5 involves a method for preservative coating of fresh-cut papayas using carboxymethyl cellulose, vanillin, calcium lactate, natamycin, and peppermint oil. The above methods are useful for the postharvest preservation of papayas, but most of these methods involve complicated steps. Therefore, it is worthwhile to further develop a simple, easy, safe and effective method for preserving papayas.

Sodium dichloroisocyanurate is an efficient and safe oxidizing bactericide, which can kill various pathogenic microorganisms including bacteria spores and fungi. It is soluble in water but insoluble in organic solvents, and has no harmful effects to human. It is widely used in the

disinfection of drinking water and preventive disinfection in various environments.

SUMMARY

In view of the above-mentioned defects of prior art, one object of the present invention is to provide a preservative solution for papayas and a method for storing and preserving papayas, which can slow down ripening of papaya fruits.

It has been found that sodium dichloroisocyanurate can be used in preparing an agent for slowing down ripening of papaya fruits, or can be used in preparing a preservative solution for papayas.

It has also been found that sodium dichloroisocyanurate can be used in preparing an agent for slowing down the yellowing of peels and pulps, slowing down the reduction of fruit firmness, and inhibiting respiration rate and ethylene release rate of papaya fruits.

A first aspect of the present invention is a preservative solution for papayas, which is an aqueous solution of sodium dichloroisocyanurate (NaDCC) with a mass fraction of 0.001%-0.1%.

Preferably, the sodium dichloroisocyanurate is presented in the aqueous solution with a mass fraction of 0.02%.

A second aspect of the present invention is a method for storing and preserving papayas, comprising the following steps:

(1) soaking a papaya fruit in the preservative solution for 3 to 5 minutes;

(2) placing the papaya fruit in an environment with a temperature of 25±2°C and a

relative humidity of 90±5% to remove water on the surface of the papaya fruit;

(3) packaging the papaya fruit using a polyethylene film bag with a thickness of 0.03 mm; and

(4) storing the papaya fruit at a temperature of 25±2°C and a relative humidity of 90±5%.

Preferably, the preservative solution is an aqueous solution of sodium dichloroisocyanurate with a mass fraction of 0.02%.

The preservative solution of the present invention is prepared by: weighing out sodium dichloroisocyanurate and dissolving in water according to the concentration.

Sodium dichloroisocyanurate is a broad-spectrum disinfectant, sterilant and algaecide, while it can effectively slow down papaya maturity by 4-6 days when used in the present invention, making it an anti-aging agent for papayas. After treated with sodium dichloroisocyanurate and subsequently stored for 12 days, the control group and the treatment group respectively exhibited a marketable fruit rate of 44% and 87%, a respiration intensity of 23.78±1.95 CO_2 mg/(kg·s) and 10.81±0.35 CO_2 mg/(kg·s), and an ethylene release rate of 0.411±0.020 μmol/(L·kg·s) and 0.19±0.002 μmol/(L·kg·s), such that the aging of papaya fruits is slowed down by inhibiting the respiration and ethylene release intensity. Through the method of the present invention, it is possible to effectively slow down the ripening of papaya fruits by 4-6 days, significantly increase the economic benefits of papayas. Through in vitro antibacterial experiments, it has been found that sodium dichloroisocyanurate can inhibit the growth of colonies of *Fusarium proliferatum*: the control group and the sodium

dichloroisocyanurate treatment group exhibited a colony diameter of 7.61±0.03 cm and 5.67± 0.07 cm respectively after a 9-day incubation. Thus, sodium dichloroisocyanurate can be applied to produce agents for inhibiting the growth of *Fusarium proliferatum.*

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows the effect of NaDCC treatment on peel hue value, pulp hue value, fruit firmness, respiration rate, ethylene release rate, and fruit quality of papayas.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The following is a further description of the present invention without limiting the scope of the present invention.

Embodiment 1

Papaya fruits, which were harvested in a mature green status in a clear day and have no mechanical damages, diseases or pests, were selected and randomly divided into two groups, a control group and a treatment group. The papaya fruits of the control group and the treatment group were respectively soaked in water and an aqueous solution of 0.02 wt% sodium dichloroisocyanurate (NaDCC) for 3 minutes, then the treated papaya fruits were placed in an environment with a temperature of 25±2°C and a relative humidity of 90±5% to remove water on the surface of the papaya fruit, packaged using polyethylene film bags with a thickness of 0.03 mm, and stored at a temperature of 25±2°C and a relative humidity of 90±5%. At day 12 of a postharvest storage, the papaya fruits of the control group and the treatment group respectively exhibited a marketable fruit rate of 44% and 87%, a respiration intensity of

23.78±1.95 CO_2 mg/(kg·s) and 10.81±0.35 CO_2 mg/(kg·s), and an ethylene release rate of 0.411±0.020 μmol/(L·kg·s) and 0.19±0.002 μmol/(L·kg·s). At day 18 of the postharvest storage, the papaya fruits of the control group and the treatment group respectively exhibited a respiration intensity of 27.91±6.95 CO_2 mg/(kg·s) and 11.01±1.28 CO_2 mg/(kg·s), and a marketable fruit rate of 44% and 61%.

Result analysis of papaya preservation. As can be concluded from FIG 1, NaDCC treatment could slow down the reduction in peel and pulp hue values of papayas, wherein the fruits of the treatment group exhibited a significant yellowing on their peels at day 12 and a significant yellowing in their pulps at day 10, while the fruit of the control group exhibited a significant yellowing on their peels at day 7 and a significant yellowing in their pulps at day 5. Also, papaya fruits treated with NaDCC exhibited a higher firmness. Compared with the NaDCC treated fruits, the fruit of the control group exhibited a higher respiration rate and ethylene release rate. Accordingly, NaDCC treatment can significantly slow down the yellowing of papaya peel and pulp and the reduction in fruit firmness, and inhibit the respiration rate and ethylene release rate, so as to slow down the ripening of papaya fruits.

Embodiment 2

Papaya fruits, which were harvested in a mature green status in a clear day and have no mechanical damages, diseases or pests, were selected and randomly divided into two groups, a control group and a treatment group. The papaya fruits of the control group and the treatment group were respectively soaked in water and an aqueous solution of 0.02 wt% sodium

dichloroisocyanurate for 5 minutes, then the treated papaya fruits were placed in an environment with a temperature of 25±2°C and a relative humidity of 90±5% to remove water on the surface of the papaya fruit, packaged using polyethylene film bags with a thickness of 0.03 mm, and stored at a temperature of 25±2°C and a relative humidity of 90±5%. After stored for 15 days, the papaya fruits of the control group and the treatment group respectively exhibited a respiration intensity of 23.08±1.45 CO_2 mg/(kg·s) and 12.88±0.75 CO_2 mg/(kg·s), a marketable fruit rate of 47% and 72%, and a pulp hue value of 87.44±11.39 and 114.88±3.44. The ripening of fruits was slowed down by 5 days.

Embodiment 3

Papaya fruits, which were harvested in a mature green status in a clear day and have no mechanical damages, diseases or pests, were selected and randomly divided into two groups, a control group and a treatment group. The papaya fruits of the control group and the treatment group were respectively soaked in water and an aqueous solution of 0.001 wt% sodium dichloroisocyanurate for 3 minutes, then the treated papaya fruits were placed in an environment with a temperature of 25±2°C and a relative humidity of 90±5% to remove water on the surface of the papaya fruit, packaged using polyethylene film bags with a thickness of 0.03 mm, and stored at a temperature of 25±2°C and a relative humidity of 90±5%. After stored for 13 days, the papaya fruits of the control group and the treatment group respectively exhibited a marketable fruit rate of 45% and 60%, and a pulp hue value of 87.56±4.22 and 98.11±4.53. The ripening of fruits was slowed down by 3 days.

Embodiment 4

Papaya fruits, which were harvested in a mature green status in a clear day and have no mechanical damages, diseases or pests, were selected and randomly divided into two groups, a control group and a treatment group. The papaya fruits of the control group and the treatment group were respectively soaked in water and an aqueous solution of 0.1 wt% sodium dichloroisocyanurate for 3 minutes, then the treated papaya fruits were placed in an environment with a temperature of 25±2°C and a relative humidity of 90±5% to remove water on the surface of the papaya fruit, packaged using polyethylene film bags with a thickness of 0.03 mm, and stored at a temperature of 25±2°C and a relative humidity of 90±5%. After stored for 9 days, the papaya fruits of the control group and the treatment group respectively exhibited a respiration intensity of 25.91±4.95 CO_2 mg/(kg·s) and 12.01±1.18 CO_2 mg/(kg·s), a fruit firmness of 1.62±0.40 kg and 6.36±0.36 kg, and a marketable fruit rate of 42% and 71%. The ripening of fruits was slowed down by 4 days.

Claims

1. A preservative solution for papayas, wherein it is an aqueous solution of sodium dichloroisocyanurate, and a mass fraction of sodium dichloroisocyanurate is 0.001%-0.1%.

2. The preservative solution according to claim 1, wherein the mass fraction of sodium dichloroisocyanurate is 0.02%.

3. A method for storing and preserving papayas, comprising the following steps:

(1) soaking a papaya fruit in the preservative solution of claim 1 for 3 to 5 minutes;

(2) placing the papaya fruit in an environment with a temperature of 25±2°C and a relative humidity of 90±5% to remove water on the surface of the papaya fruit;

(3) packaging the papaya fruit using a polyethylene film bag with a thickness of 0.03 mm; and

(4) storing the papaya fruit at a temperature of 25±2°C and a relative humidity of 90±5%.

4. The method according to claim 3, wherein the mass fraction of sodium dichloroisocyanurate is 0.02%.

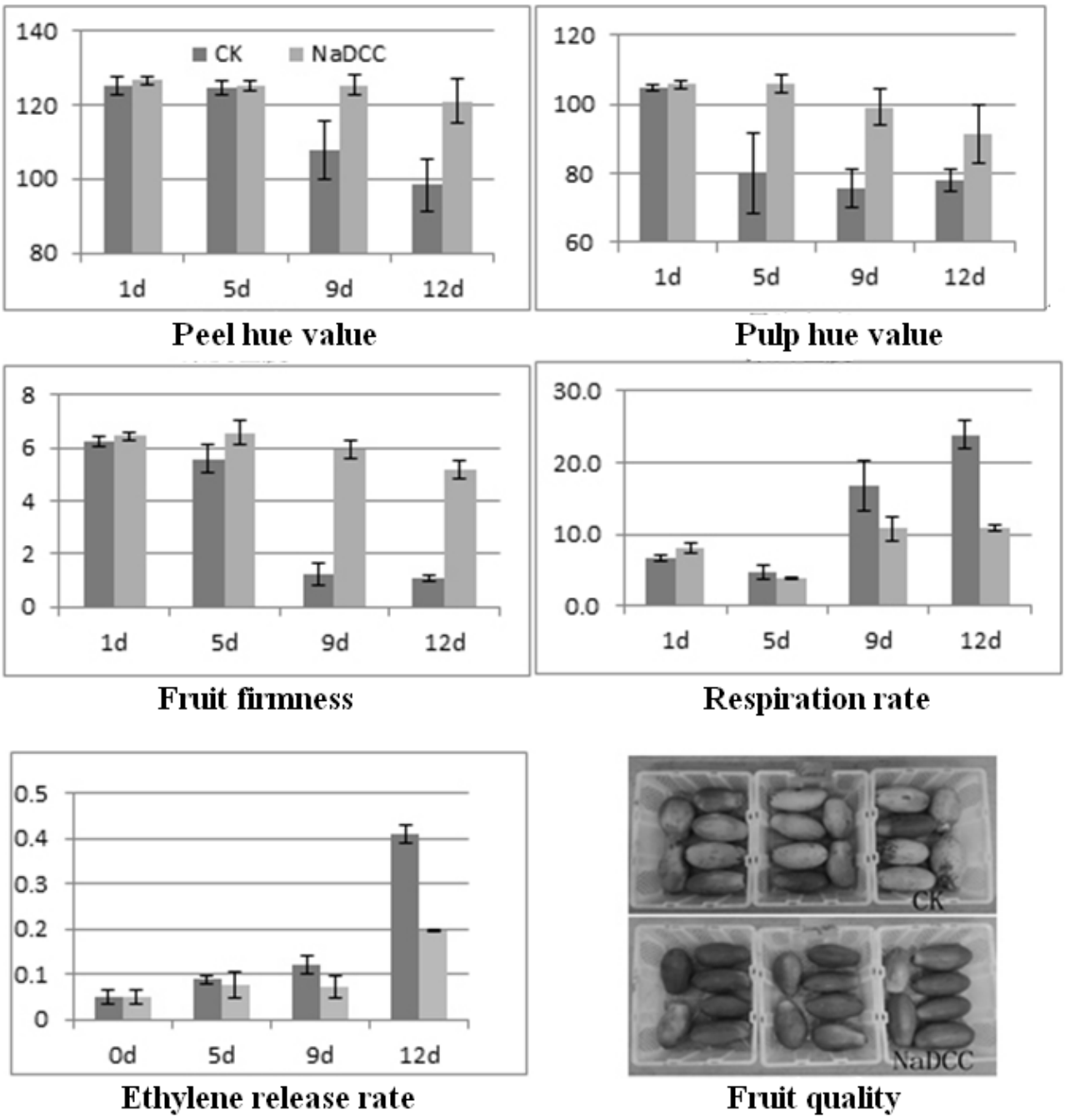

FIG. 1